Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

we have $297a-7533b=135a-1701b$ or $a=36b$. But $a=3$ and therefore $b=\frac{1}{12}$.

Substituting these values and $y=21$ in the first equrtion $x=\frac{3}{4}$ making the width 1½ inches.

PROBLEMS.

18. **Proposed by M. C. STEVENS, A. M., Professor of Mathematics, Purdue University, Lafayette, Indiana.**

Show generally that a system of confocal conics is self orthogonal. [From Johnson's Differential Equations.]

19. **Propoped by F. P MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in New Windsor College, New Windsor, Maryland.**

A spherical shrapnel-shell moving in a practically horizontal direction with a constant velocity $V_1=1500$ feet per second and at a uniform height $h=\frac{1}{2}g$ feet, explodes *equably* scattering the inclosed balls and fragments with a uniform velocity $V_2=1200$ feet per second. Draw the curve bounding the *minimum surface on the earth* on which the inclosed balls and fragments of the shell have fallen.

◆

QUERIES AND INFORMATION.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

Definitions of a Fraction. A Query by "H. C. K."

Three views of what a fraction is are here given, with the request that every reader send the editor of this department a card stating his preference.

(A). A fraction is one or more of the equal parts into which "a unit" or anything is divided; as, $\frac{m}{n}$. When $m>n$, the fraction is called "improper".

(B). A fraction is a number of the equal parts of one or more like units or things. The fraction $\frac{m}{n}$ is proper whether $m>n$ or $m<n$.

(C). A fraction is any number of the equal parts into which anything is divided, less than the whole number of such parts. When $m=n$, $\frac{m}{n}$ is a unit. When $m>n$, $\frac{m}{n}$ is a mixed number in fractional form,—not a fraction at all, since we can not take m equal parts of a thing divided into only n parts.

"An Unreasonable Rule" Again. By Professor P. H PHILBRICK.

Mr. Pratt fails to make out his case. He does show indeed that the rate of convergency in the vicinity of the parallel of 50° latitude is nearly one-fifth more than near the parallel of 40° latitude but no one, so far as I know, has doubted that, for these parallels are nearly 700 miles apart, whereas across four townships is but 24 miles, or about one thirtieth as far.

For 20′, or say 23 miles, on each side of the parallel of 40°, we have as follows:

$$\begin{array}{rl} \cos 39^\circ\ 20' = .76977 & \cos 40^\circ\ 00' = .76604 \\ \cos 40^\circ\ 00' = \underline{.76604} & \cos 40^\circ\ 20' = \underline{.76229} \\ \text{Difference} = .00373 & .00375 \end{array}$$

These results show the convergency for 23 miles on one side of latitude 40°, is practically the same as on the other side. So generally for other points.

Curious Process for Maximum or Minimum, by EDMUND FISH, Hillsboro, Illinois.

Example 1. A farmer says to his son, we are now ready to measure off and fence in the ten acres for our new orchard. The east side is adjacent to the Railroad and is already fenced. On the north it joins neighbor Brown, and he agrees to make half that fence. So the south side, the west side and half the north side are all we have to make. Now I propose to make the length and breadth just such as can be inclosed with the least fence, and as soon as you have figured that out, we will set about it. John takes his pencil and remarks,—The width of the field shall be x rods. Then the length will be $\frac{1600}{x}$, and the fence required will be expressed by $\frac{3x}{2}+\frac{1600}{x}$.

For a second member, for want of anything better, continues John, we will place this expression equal to itself. The farmer smiles at this sage proposal, for he too knows something of algebra, but John goes on, $\frac{3x}{2}+\frac{1600}{x}=\frac{3y}{2}+\frac{1600}{y}$, in which x and y represent the same thing.

Reducing gives, $3x^2y+3200y=3xy^2+3200x$,

$$3(x^2y-xy^2)=3200\ (x-y),$$

$3xy=3200$, and x and y being identical, $3x^2=3200$, whence $x=40\sqrt{\tfrac{2}{3}}$, which proves to be exactly right.

Ex. 2. Required a rectangle with a perimeter of 100 which shall leave the largest remainder when a square has been taken off one end.

Let x=width, $50-x$=length.

$$\begin{gathered} 50x-x^2=\text{area},\ 50x-2x^2=\text{remainder}, \\ 50x-2x^2=50x-2x^2, \\ 2(x^2-x^2)=50(x-x) \\ 2(x+x)=50 \\ x=12\tfrac{1}{2}. \end{gathered}$$

Ex 3. American Mathematical Monthly, No. 3, p. 89.

From a given quantity of material a cylindrical cup with circular bottom and open top is to be made, the cup to contain the greatest amount.

Let m=amount of material,

x=radius of bottom,

$2\pi x$=circumference of bottom,

πx^2=area of bottom,

$m-\pi x^2$=convex area.

$\dfrac{m-\pi x^2}{2\pi x}$=depth.

Then $\dfrac{m-\pi x^2}{2\pi x}\times\dfrac{\pi x^2}{1}=\dfrac{mx}{2}-\dfrac{\pi x^3}{2}$=capacity.

Taking x and y as identical and omitting denominators $mx-\pi x^3=my-\pi y^3$, or $\pi(x^3-y^3)=m(x-y)$; whence $\pi(x^2+xy+y^2)=m$, and $\pi x^2=\dfrac{m}{3}$. $\therefore$ the bottom will require $\frac{1}{3}$ of the material.

Then $\dfrac{2m}{3}$=convex surface and this divided by circumference of bottom will give the depth.

$\dfrac{2m}{3}\times\dfrac{1}{2\pi x}=\dfrac{m}{3\pi x}$, which by last equation above=x.

Hence the depth must equal the radius of the bottom.

Ex. 4. Let the last example be modified by the condition that the cup is made of sheet metal, the bottom being cut from a square piece, and the trimmings wasted. What ratio of depth and diameter will be most economical of material.

Let m=material,

x=radius of bottom,

a=depth.

Then $2\pi x$=circumference of bottom,

πx^2=area of bottom,

$4x^2$=bottom and waste,

$m-4x^2$=convex surface,

$\dfrac{m-4x^2}{2\pi x}=a$=depth, $\dfrac{\pi x^2}{1}\times\dfrac{m-4x^2}{2\pi x}=\dfrac{mx}{2}-\dfrac{4x^3}{2}$=capacity. $mx-4x^3=my-4y^3$, $4(x^3-y^3)=m(x-y)$, $\therefore$ $12x^2=m$.

Substituting this value of m in the value of a above gives $a=\dfrac{4x}{\pi}$.

$\therefore$ $a:x::4:\pi$.

EDITORIALS.

We have just recently availed ourselves of a set of the Analyst. But the set is not complete as No. 7 Vol. I., No. 6 Vol. V., and No. 1 Vol. IX. are missing. Any of our readers who have these Nos. for sale will do us a favor by writing to us at Kidder, Mo.

Professor J. K. Ellwood should have received credit for solving No. 27, Arithmetic Department.